Western Administrative Support Center
National Oceanic and Atmospheric Administration
Seattle, Washington

CONCEPTUAL DESIGN

for

PROPOSED NMFS HONOLULU LABORATORY RENEWAL PROJECT

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FINAL SUBMITTAL
June 7, 1999

Prepared by:

SUMMIT TECHNOLOGY
CONSULTING ENGINEERS, INC., P.S.
615 Second Avenue, Suite 580
Seattle, WA 98104

In Association with:

- **MWM Architects, Inc.**
- **Ferraro Choi & Associates, Ltd.**
  Architecture
- **Lincolne Scott & Kohloss, Inc.**
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EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) is engaged in a study to renew the Southwest Fisheries Science Center (SWFSC) Honolulu Laboratory located adjacent to the University of Hawaii Manoa Campus in Honolulu. The proposed facility includes offices, laboratories, and support facilities for the existing SWFSC Laboratory, the Southwest Region (SWR) Pacific Islands Area Office (PIAO), and the SWR Enforcement Office. A facility program requirements report for the proposed facility was developed in the initial phase of this work program. The current edition of the program requirements report, entitled *Facility Program Requirements Update for Proposed NMFS Honolulu Laboratory Renewal Project*, was completed in September 1998. An addendum with revisions to the requirements document was published November 13, 1998. The subsequent phase of the work program developed alternative schemes for the renewal of the facilities, and a report, *Blocking and Massing Studies for the Proposed NMFS Honolulu Laboratory Renewal Project*, was completed in October 1998. The blocking and massing studies for the Demolition and Reconstruction and Renovation/Addition alternatives developed in that report served as the basis for the more in-depth concept design studies undertaken in the current phase of the work program.

Demolition and Reconstruction Alternative. In this alternative the site is cleared to make way for the construction of a completely new facility. Because more of the site is available for construction, most of the parking can be accommodated in a single, below-grade parking level. A new, four-story, 9750-sq.-m [104,900-sq.-ft.] office and Laboratory building will be constructed over a single, 3850-sq.-m [41,400-sq.-ft.] basement parking level.

Renovation/Addition Alternative. The existing Laboratory building is maintained and renovated for continued use. Both levels of the building's central courtyard will be filled in, to provide additional floor area. The two annex buildings located on the mauka (northern) portion of the property will be demolished, to make way for the construction of a new four-story structure and two levels of below-grade parking. The parking levels, which will be served by one of the building's two elevators, will be accessed via a vehicular ramp that originates from a central vehicular entrance courtyard.

The proposed new 6450-sq.-m [70,400-sq.-ft.] addition will connect at both levels of the existing Laboratory building and will bridge the existing building at the third floor, to connect to a partial new third floor constructed above the central portion of the existing Laboratory building. Elevators in the new four-story structure are connected by corridors to the original building and will serve the floors of the existing Laboratory building. A system of internal, ramped corridors replace the steps at the level changes in the renovated structure, to accommodate the required handicapped accessibility. The renovated/remodeled Laboratory building, including the new infill structure in the central courtyard and the new partial third floor, totals 2950 sq. m [31,800 sq. ft.].

PREFACE

The National Oceanic and Atmospheric Administration (NOAA) is engaged in a study to renew the Southwest Fisheries Science Center (SWFSC) Honolulu Laboratory located adjacent to the University of Hawaii Manoa Campus in Honolulu. The proposed facility includes offices, laboratories, and support facilities for the existing SWFSC Laboratory, the Southwest Region (SWR) Pacific Islands Area Office (PIAO), and the SWR Enforcement Office. A facility program requirements report for the proposed facility was developed in the initial phase of this work program. The current edition of the program requirements report, entitled *Facility Program Requirements Update for Proposed NMFS Honolulu Laboratory Renewal Project*, was completed in September 1998. The subsequent phase of the work program developed alternative schemes for the renewal of the facilities, and a report, *Blocking and Massing Studies for the Proposed NMFS Honolulu Laboratory Renewal Project,* was completed in October 1998. The blocking and massing studies for the Demolition and Reconstruction and Renovation/Addition alternatives developed in that report served as the basis for the more in-depth concept design studies undertaken in the current phase of the work program.

In November 1998 the decision was made by NOAA Program Managers to review the FTE numbers and the facility requirements program for the proposed facility. An addendum with revisions to the requirements document was published November 13, 1998. The revisions increased programmed area assignments in some areas and reduced them in others, resulting in an overall reduction in the assignable floor area requirement from 6430 square meters (sq. m) [69,200 square feet (sq. ft.)] to 6240 sq. m [67,200 sq. ft.]. The addendum, which projected an overall gross building floor area of 8080 sq. m [87,000 sq. ft.], became the basis for the design of the alternatives presented in this report.

The work on the concept design studies was conducted by personnel from Summit Technology Consulting Engineers, Inc., P.S., of Seattle; MWM Architects, Inc., Oakland, Calif.; Ferraro Choi & Associates, Ltd., Honolulu; Lincolne Scott & Kohloss, Inc., Honolulu; and Rider Hunt, Construction Consultants and Quantity Surveyors, Honolulu.

Personnel from Summit, MWM, and Ferraro Choi participated in a series of meetings and workshops conducted at the Honolulu Laboratory during the week of November 16-20, 1998. Actively involved in the work sessions, and playing a key role in the development and critique of the schemes described in this report, were key representatives and staff from NMFS in Washington, D.C., NOAA WASC in Seattle, SWFSC in La Jolla, Calif.; the SWFSC Honolulu Laboratory, SWR PIAO, Enforcement–SW, as well as NOAA Project and Program Managers.

At the outset of the work sessions, the need for a four-story alternative was discussed as a means to reduce the building footprint and increase usable open space. Variations on the three- and four-story alternatives originally introduced in the *Blocking and Massing Studies* report were compared and evaluated, and the decision was made on the initial day of the workshop to switch the emphasis of the concept development to the four-story schemes, for the primary Demolition and Reconstruction and Renovation/Addition alternatives. These schemes were developed in the weeks following the workshop and completed for use in the Value Engineering Review, the Environmental Assessment, and presentation in this report.

I. BACKGROUND INFORMATION

A. EXISTING FACILITIES

Main Laboratory Building. The total net floor area in the existing two-story Laboratory building assignable to offices, laboratory, and support functions is 1238 sq. m [13,325 sq. ft.]. The two floors, essentially equal in area, provide approximately 613 sq. m [6600 sq. ft.] per floor. The building has a gross floor area of 1814 sq. m [19,530 sq. ft.]. The building's ground floor footprint, including 148 sq. m [1600 sq. ft.] in the central courtyard, is 1077 sq. m [11,600 sq. ft.].

Annex Buildings. The two separate annex buildings together provide a total of 1532 sq. m [16,500 sq. ft.], bringing the total assignable area in the three buildings to approximately 2770 sq. m [29,260 sq. ft.].

Site. The site totals 0.9 hectares [2.2 acres—95,830 sq. ft.], although almost one-third of the property lies within the Dole Street and Manoa Stream rights-of-way. The developed area of the site, which excludes these areas, is 5603 sq. m [60,310 sq. ft.], or approximately two-thirds of the total area.

There are currently 65 parking spaces on-site including 48 in the primary parking area, four in a garage in Annex I, and 13 spaces in a service area mauka (north) of Annex II. The primary parking area has access via an existing roadway from Dole Street, on University property, and shared with the East-West Center building located immediately ewa (west) of the property. The small lot at the rear has access from East-West Road along a partially developed right-of-way serving the Hawaiian Electric Substation mauka (north) of the property.

B. PROJECTED FACILITY REQUIREMENTS

Program projections call for an assignable building area of 6242 sq. m [67,200 sq. ft.]—estimated to require a gross building area of 8082 sq. m [87,000 sq. ft.]. A total of 135 parking spaces is required, including parking for staff, visitors, and government-owned vehicles. The preceding gross floor area estimate does not include building areas required to accommodate parking.

C. DEVELOPMENT CONSTRAINTS

The steep embankment leading down to Manoa Stream and the existing right-of-way improvements along Dole Street limit the development area to approximately 5574 sq. m [60,000 sq. ft.]. Building code and zoning setbacks further restrict the potential building footprint to an area of approximately 4194 sq. m [45,000 sq. ft.].

The main Laboratory building occupies approximately 2323 sq. m [25,000 sq. ft.] immediately fronting on Dole Street. The actual footprint is 1078 sq. m [11,600 sq. ft.], including the 149-sq.-m [1600-sq.-ft.] central courtyard.

Removal of the two annex structures will provide an area at the rear of the property of approximately 2415 sq. m [26,000 sq. ft.] for new development. This area, which includes the existing parking area in the center of the site, is the primary development area for the scheme involving an addition to the main Laboratory building.

Vehicular access to the property is currently via a shared driveway access across the neighboring campus property. This access is a verbal easement based on a "gentleman's agreement," and it is assumed that this arrangement, with the proposed new development on the Laboratory property, will continue to serve as the primary entry to the site.

It is assumed also that suitable arrangements can be made to develop the existing Pope Road right-of-way, which leads into the mauka (northern) portion of the property from East-West Road. Improvements will be required to a parcel immediately mauka (north) of the Laboratory property. This parcel is partially controlled by the Hawaiian Electric Company (HECo) and is used for a primary electrical substation serving the campus. In both of the proposed development alternatives the objective is to develop a service entrance and parking facility on the mauka (northern) portion of the property that can accommodate medium-size trucks and service vehicles.

The development of a vehicular access through the property—an option that would provide an alternative route from East-West Road to Dole Street—has been discouraged by the East-West Center as a dangerous and potentially disruptive element.

II. BUILDING CODE AND LAND USE REGULATIONS

A. Building Codes

1. Applicable Code

The design will comply with the Honolulu Amendments to the Uniform Building Code (Building Code), latest edition, and that edition of the Uniform Building Code (*UBC*) currently adopted. The current edition is the 1994 *UBC*. It is anticipated that the next edition of the Building Code will be published in 2000 and will adopt the 1997 *UBC* as the standard. Analyses in the following sections are based on standards found in the 1997 *UBC*.

2. Preliminary Analysis

Occupancy Classification. All buildings and structures are classified in the *UBC* by use or character of occupancy. The occupancy classification is used in the code to establish life safety requirements appropriate to the building's use. The primary use for the primary classification of the proposed new building(s), based on occupancy categories in the *UBC* is Group B: "office, laboratory - testing and research." Certain spaces within the building because of their use, such as the seminar rooms, will be classified differently. Following are the identified occupancies:

Group	Description
B	Office, laboratory - testing and research
A-3	Assembly - a building or a portion of a building having an assembly room with an occupant load of less than 300 without a legitimate stage
S-3	Parking garages not classed as Group S, Division 4 open parking garages

Hazardous materials storage. The appropriate classification for the hazardous materials storage building has not been determined at this time. For purposes of code analysis, it is assumed that the hazardous materials storage facilities will be accommodated in a separate, stand-alone structure.

Note that for purposes of analysis, parking garages classified as Group S-3 (located in the basement or first story of a building with Group A, Division 3, and Group B occupancies above) may be considered a separate and distinct building for the purpose of area limitations, limitation of number of stories, and type of construction. To qualify, the following conditions must be met:

1. *The basement or first story is Type I construction and is separated from the building above with a three-hour occupancy separation;*
2. *The building above the three-hour occupancy separation contains only Group A, Division 3; Group B; or Group M or R, Division 1 Occupancies;*
3. *The building below the three-hour occupancy separation is a Group S, Division 3 Occupancy used exclusively for the parking and storage of private motor vehicles; and*

4. *The maximum building height in feet shall not exceed the limits for the least type of construction involved.*

Assuming that the above conditions can be met, and based on the analyses below, it appears that the separation of the basement garage levels will qualify the building for “Type II, One-hour” construction.

Type of Construction. The type of construction is determined in the *UBC* based on building occupancy, floor area, and number of stories. Given the occupancy categories listed above, the current programmed floor areas, and the proposed number of stories, it is assumed that the building will be classified as either a “Type II, Fire-resistive” or “Type II, One-hour” construction.

Buildings categorized as primarily Group B occupancies meeting the requirements for “Type II, Fire Resistive” construction qualify for a basic allowable building floor area of 3707 sq. m [39,900 sq. ft.] and 12 stories (or 49 m [160 ft.]). If constructed as a “Type II, One-hour” building, the basic allowable building floor area is 1672 sq. m [18,000 sq. ft.] and four stories (20 m [65 ft.]).

Increases are permitted in the basic area. Based on a preliminary analysis of the increases allowed for multistory buildings, compounded with allowable increases for site separation (two sides) and the installation of an automatic fire sprinkler system, it appears that the building will qualify for construction as a “Type II, One-hour” building.

Fire-resistive Requirements for Key Building Elements. Fire-resistive requirements, in hours, are as follows for key building elements (assuming “Type II, One-hour” construction):

Building Element	**Fire-resistive Requirement**
Building walls–exterior	one-hour
Nonbearing walls–exterior	one-hour
Structural frame	one-hour
Partitions–permanent	N.R.
Shaft enclosures	one-hour
Floors and floor–ceilings	one-hour
Roofs and roof–ceilings	one-hour
Corridors	one-hour

There are several applicable exceptions to the required one-hour fire-resistive rating of building corridor walls and ceilings: a) the exterior side of exterior exit balconies; b) corridor walls and ceilings within office spaces having an occupant load of 100 or fewer, when the entire story in which the space is located is equipped with an automatic sprinkler system throughout and an automatic smoke-detection system is installed within the corridor.

B. ZONING REGULATIONS AND STANDARDS

Zoning within urban areas of Oahu, where the site falls, is governed by the City and County of Honolulu's Land Use Ordinance (LUO). References made in this section are to the LUO unless otherwise noted.

1. Applicable Regulations

Land Use Designation. The City and County of Honolulu Zoning District Designation for the site is R-5.

Zoning district regulations for R-5 (§5.40): Permitted uses and structures are listed in Table 5.2-A of the LUO. Public uses and structures are listed as permitted principal uses in that table. Specific development standards relative to the zoning district designation are listed in Table 5.2-B. They are as follows:

Minimum Lot Area: 465 sq. m [5000 sq. ft.]
Minimum Lot Width: 15.3 m [50 ft.]
Front Yard (Dole Street) Depth: 9.1 m [30 ft.]
Side Yard (Ewa) Depth: 4.6 m [15 ft.]
Rear Yard Depth:4.6 m [15 ft.]
Side Yard (Manoa Stream) Depth: 4.6 m [15 ft.]t
Maximum Building Area: 50 percent of zoning lot

> *Building Area is defined in Article 9 as "...the total area of a zoning lot covered by buildings and covered open areas..." excepting those "...open areas covered by eaves and normal overhanging of roofs." Subterranean structures or above ground structures covered by landscaping can be discounted from the calculation of Building Area. No limits are placed on lot density in residential zones.

Maximum Height: the intersection of two planes: (1) a horizontal plane that is 7.6 m [25 ft.] above the high point found on the buildable area boundary, and (2) a plane 9.1 m [30 ft.] above the existing or new grade (whichever is lower), measured parallel to grade.

Side and Rear Yard Height Setbacks: Sloping back from the buildable area boundary at a rate of 0.6 m [2 ft.] (rise) over 0.3 m [1 ft.] (run), starting at 4.6 m [15 ft.] above grade.

Front Yard Height Setback: Sloping back from the buildable area boundary at a rate of 0.6 m [2 ft.] (rise) over 0.3 m [1 ft.] (run), starting at 6.1 m [20 ft.] above grade.

2. General Development Standards

Yards and Street Setbacks (§3.30(d))

Parking and loading. §3.30(d) states that "Parking and loading shall not be allowed in any required yard, except parking in front and side yards in ... residential districts...."

Heights (§3.60)

Applicable height limits listed in the Zoning District. Regulations are discussed above. §3.60(a) stipulates general conformance to height requirements. §3.60(b) describes how the building envelope is to be determined. §3.60(c) specifies exceptions to height limits. Height of Antenna— §3.60(c)(4)(B)—is an exception allowing broadcast antennas to exceed the height limit by no more than 3 m [10 ft.].

Off-street Parking (§3.70-1)

Number required. §3.70-2(a) specifies that the number of parking stalls required is determined based on "floor area" as defined in Article 9 and is calculated based on an appropriate multiplier found in Table 3.1 (A).

*Per Article 9, Floor Area basically amounts to all of the building area covered by a roof, with the exception of attics, lanais, and the areas under roof overhangs, sunshades, and awnings. The multiplier found in Table 3.1 (A) that is appropriate to this project's use is Offices - 1 parking stall per 37.3 sq. m [400 sq. ft.].

Parking Stall Size. §3.70-2(d) states that all parking stalls shall be standard size. In §3-70.4 the minimum size of a standard stall is defined to be 18' long by 8'-3" wide.

Off-street Loading (§3.70.10)

Number required. The number of loading stalls required is given in a table found in §3.70-10.

Size. As described in §3.70- 12(b), at least 50 percent of the required stalls shall measure at least 35' wide by 12' wide. The remainder shall measure at least 19' long by 8'-6" wide.

Landscaping and Screening (§3.80)

Landscape Planting. §3.80(d) stipulates that "...parking structures with open or partially open perimeter walls which are adjacent to zoning lots with side or rear yard requirements shall meet the following requirements:"

"(1) An 18" landscaping strip along the abutting property line...

"(2) A minimum 2" caliper tree... every 50 linear feet of building length...

"(3) Each parking deck along the abutting property line shall have a perimeter wall at least two feet in height to screen vehicular lights...."

Screening. §3.80(e) states that all outdoor trash areas be screened on three sides by a 6' tall wall. §3.80(f) states that all service areas be screened from adjoining lots by a 6' tall wall.

Sunlight Reflection Regulation (§3.110)

This section pertains to reflective surfaces and their effect on streets surrounding the site. It dictates that studies be made when a "...building wall contains a reflective surface for more than 30 percent of the of that wall's surface area..." which impact "public rights of way." The studies should be made at a point in the future when the extent and type of reflected surface on the face of the building can be determined.

Waiver of Requirements (§3.150)

§3.150(a) states that "waiver of the strict application of the development or design standards of this chapter may be granted by the director for the following: (1) Public uses and structures...."

3. Conformance

Federal authority generally supersedes local authority. This is the case with respect to local land use regulation: The federal government is not bound to conform with local regulations pertaining to land use. However, NOAA is very sensitive to the context of its site and intends to include local authorities in discussion of the Laboratory facility's design.

To that end, NOAA will continue a dialogue with the City and County of Honolulu regarding land use issues. The dialogue is intended to result in the City eventually granting informal approval of the project. The City's approval will be sought primarily via the normal process to obtain a building permit—a process in which formal procedures are followed but formal approvals are not expected. In this manner, each City agency with an area of responsibility that is affected by the project will be kept informed and will have an opportunity to provide comment.

III. SUSTAINABLE DESIGN

The goals of sustainable design are generally to minimize energy use, expense, waste, and impact on the environment. These are the primary goals with respect to the HLRP, and the primary reason for integrating sustainable design guidelines and practices in the overall design process. The desire to produce a resource-efficient building project has guided the development of all alternatives considered for the HLRP.

Most of the sustainable design features and characteristics listed below apply to both of the alternatives currently under consideration. The Renovation/Addition Alternative is unique in that it explores the reuse potential of the original Laboratory building constructed in the 1950s.

A. SPECIFIC SUSTAINABLE DESIGN ELEMENTS AND ACTIVITIES

Specific sustainable design elements and activities include the following:

- Value-engineering analysis has been applied during the concept design phase, to improve building efficiency and maximize the use of available funding resources. Many of the recommendations developed as a result of the value engineering analysis will be incorporated in the building designs.
- Guidelines for incorporation of sustainable design criteria in the project specifications will be adopted and included in future design phases.
- Provisions for "commissioning" the completed project have been proposed to ensure that the energy-efficient systems and equipment are installed and performing as anticipated.

B. SITE SELECTION AND DESIGN

Site selection and design include the following features:

- Reuse of the existing site will take advantage of the existing utility infrastructure, eliminate potential impacts associated with the development of alternative new sites, and maintain established relations with the university community.
- Preservation of the natural resource. Care has been taken to set the new structures back from the top of the streambank; measures will be taken during construction to protect the natural embankment. Runoff from impervious surfaces will be collected and controlled, to minimize the impact on the water course.
- Building setbacks and the configuration of the building footprint minimize impacts on the adjoining campus buildings.

- Studies have been prepared for the purpose of minimizing the impact of traffic to and from the site; sufficient on-site parking has been provided to minimize the need for, and use of, on-street parking and campus parking facilities.
- Planting will be selected to minimize irrigation requirements; irrigation systems will be designed to minimize waste and ensure efficiency of water use.
- Tree and streambank protection will be established prior to initiating construction activity.

C. Building Design

Building design includes the following features:

- Portions of the building corridors are outside the mechanically conditioned building envelope, a feature that reduces the mechanical cooling load and takes advantage of opportunities for natural ventilation.
- Office areas are planned to maximize internal flexibility—interior partitions within office areas are relocatable and modular office workstations will be used in all open office areas.
- Facilities are provided to promote biking/walking, including dedicated parking areas, locker, and shower facilities.
- Recycling collection facilities are provided on-site.
- Energy-efficient elements are used to maximize opportunities for natural cooling—they include reflective, light-colored exterior materials; natural shading; and mechanical solar screening.
- Exterior courtyards, covered walkways, and lanais are used in the designs to open the indoor areas out to the natural environment and promote staff and visitor use of outdoor areas.

D. Construction Methods

Construction methods will include the following features:

- Procedures will be adopted to minimize the potential impacts associated with excavation for the below-grade parking structure. Explosive charges will be small—the existing asphalt, concrete paving, and soil cover will be left in place to muffle the noise of the controlled blasting.
- Temporary protective walls and screens will be used to minimize the impacts of construction activity on adjoining structures.

E. Energy Use

Energy use will include the following:

- Building systems will be controlled by a Building Energy Management System (BEMS).
- Office layouts maximize opportunities for natural lighting.
- Energy-efficient lighting, generally fluorescent, will be utilized.

- Lighting will be controlled by occupancy sensors in interior office spaces; task lighting will be promoted as an energy-efficient alternative.
- Mechanical systems will be designed to comply with federal and locally adopted energy Codes.
- Locally available building products will be specified wherever possible, to comply with the general goal of utilizing less embodied energy.

F. MECHANICAL SYSTEMS DESIGN

Mechanical systems design will include the following features:

- Non-ozone-depleting refrigerant will be used in the chillers.
- Chillers will be selected for minimum power consumption at varying levels.
- Chillers will be equipped with heat recovery systems to preheat service water.
- Cooling towers will be constructed of long-life materials (stainless steel, fiberglass-reinforced plastic); two-speed motors will be used on cooling towers.
- Premium efficiency motors will be used on pumps and air-handling units (and other equipment where available).
- Variable air volume will be used in most areas, and variable-speed drives will be incorporated on most air-handling units.
- Carbon dioxide monitors will be used to control garage ventilation fans, allowing reduced airflow (and energy use) with low vehicular traffic.
- High-efficiency filters will be used on most systems.
- Water-efficient plumbing fixtures will be used in the building.

G. AIR QUALITY

Air quality will include the following features:

- Specific actions will be taken to avoid or minimize potential contamination sources during construction, renovation, and remodeling.
- Tests have been conducted for asbestos, lead paint, and other hazardous materials in the existing Laboratory buildings.
- Separate mechanical ventilation exhaust systems will be installed in laboratory, specimen storage rooms, and shop facilities.
- Special facilities are provided for the proper storage, use, and disposal of hazardous materials.

IV. DEVELOPMENT ALTERNATIVES

A. INTRODUCTION

Two primary development alternatives are presented in this document: the Renovation/Addition Alternative, which was designed to renovate and reuse the original two-story Laboratory building; and a Demolition and Reconstruction Alternative, which replaces all of the existing structures with an entirely new facility. Early studies developed for the Renovation/Addition Alternative projected a three-story scheme for this alternative. Further development of the design indicated the need for at least a partial fourth floor, and this requirement is currently reflected in the concept design for the Renovation/Addition Alternative presented in this report.

Three- and four-story schemes were considered for the Demolition and Reconstruction Alternative; both were presented for review at the Concept Design Workshop conducted in Honolulu in November 1998. The desire to decrease building coverage (and increase open space) and minimize impacts on neighboring properties, coupled with other generally favorable reviews of the four-story alternative, led to the decision to forgo the three-story scheme and further develop the four-story scheme as the recommended Demolition and Reconstruction Alternative.

B. RENOVATION/ADDITION ALTERNATIVE

1. General Description

In this alternative the main Laboratory building will be maintained and renovated for continued use. Both levels of the building's central courtyard will be filled in to provide additional floor area. The two annex buildings located on the mauka (northern) portion of the property will be demolished to make way for the construction of a new four-story structure and two levels of below-grade parking. The parking levels, which will be served by one of the building’s two elevators, will be accessed via a vehicular ramp originating from a central vehicular entrance courtyard.

The existing driveway from Dole Street will be maintained as the primary vehicular entrance for staff and visitors. The right-of-way from East-West Center Drive will be improved to provide access (and, possibly, additional off-site parking) to a new service yard on the mauka (north) side of the building. All of the Laboratory and storage facilities requiring on-grade service and dock-type loading access will be accessed from this service yard.

The new four-story 6540-sq.-m [70,400-sq.-ft.] building will connect at both levels of the existing Laboratory building and will bridge the existing building at the third floor to connect to a partial new third floor constructed above the central portion of the existing Laboratory building. Elevators located in the new four-story structure are connected by corridors to the original building and will serve the floors of the existing Laboratory building. A system of internal ramped corridors replace the steps at the level changes in the renovated structure to accommodate the required handicapped accessibility. The renovated/remodeled Laboratory building, including the new infill structure in the central courtyard and a new partial third floor, totals 2950 sq. m [31,800 sq. ft.].

2. Assignments by Building Level

Parking Levels. A total of 122 spaces is provided on the two below-grade parking levels, with access via a ramp down from the ground level courtyard in the central portion of the site. The elevator located in the mauka (northern) portion of the new building serves the parking levels.

Ground Floor. The facilities service areas, including maintenance shops and receiving/shipping functions, the wet laboratories, specimen storage, and freezer/refrigerator storage areas are located in the mauka (north) wing of the building on the Diamond Head (east) side of the ramp down to the parking levels. The building's main entrance, including the visitor reception, exhibits, and conference rooms, is immediately makai (south) of the ramp. The main entrance is connected by a mauka-makai (north-south) corridor to the mauka (north) side of the original Laboratory building. The two buildings are separated by a courtyard/lanai that is actually covered two floors above by a new third floor level constructed above the former central courtyard. The main seminar rooms occupy the building’s central courtyard area; field services functions, including PIAO Observer Program equipment storage, are along the ewa (west) side of the building; Administration and Editorial offices occupy the majority of the remaining ground floor area. The facility's main electrical and mechanical room are located in the existing seminar room on the makai-ewa (southwest) corner of the building. Service access to this area will be directly from Dole Street.

Site Features. The primary entrance for staff and visitors is via the existing shared driveway from Dole Street. The ramp down to the below grade parking levels is immediately mauka (north) of the main visitor entrance; all accessible parking spaces are grouped on grade near this main entrance. In this scheme the visitor information/reception area is on the stream side of the building across an entry courtyard from the drop-off area. A partially covered courtyard/lanai separates the old and new buildings. This area opens on the stream side to the landscaped areas along Manoa Stream.

Ten visitor spaces (including five handicapped spaces) are located in the immediate vicinity of the main entrance on the ewa (west) side of the building; five spaces are provided in the service yard mauka (north) of the building.

Second Floor. Offices for ITS, including Hi Tech and CoastWatch, staff lockers and exercise room, and the offices of FMEP occupy the entire second floor of the new wing. The bridge-like structure across to the original building connects directly to the staff lunchroom and kitchen and a new covered lanai built along the mauka (north) side of the building. The library occupies the new second level constructed in the former central courtyard, with offices and reading rooms arranged along the Manoa Stream side. Offices for WPacFIN are located on the ewa (west) side of the original building and FDMP is assigned the remainder of the floor along the makai (south) side of the building.

Third Floor. EEI, SAI, and FBEI occupy the entire mauka (north) wing of the new building; the Director's Office is centrally located in the new connector to the PIAO offices located on a new third level structured over the original Laboratory building.

Fourth Floor. Enforcement and PSI occupy the fourth floor of the building, a partial floor located entirely within the footprint of the new building.

C. DEMOLITION AND RECONSTRUCTION ALTERNATIVE

1. General Description

The Demolition and Reconstruction Alternative is based on clearing the site to make way for construction of a completely new facility. Because more of the site is available for construction, the majority of the parking can be accommodated in a single below-grade parking level. A new four-story 9750-sq.-m [104,900-sq.-ft.] office and Laboratory building will be constructed over a single 3850-sq.-m [41,400-sq.-ft.] basement parking level.

Staff parking in the basement level will be accessed via a new driveway entrance from Dole Street. The new building's main entrance will be on the level above in the central part of the site, and will be served by the existing driveway that is shared with the adjoining East-West Center.

The building is arranged linearly along the primary mauka-makai (north-south) axis of the property. The primary entrance is configured around a central entrance and visitor parking area in a courtyard-like entrance constructed partially over the below-grade parking structure.

The mauka (northern) portion of the ground floor will accommodate the laboratories and service areas that require access to the service yard. The remainder of the ground floor will be dedicated to public-oriented and administrative functions associated with the Laboratory.

The location of various program elements were reviewed in some detail during the course of the November 1998 workshops, particularly with respect to the manner in which the elements would be assigned in the proposed four-story alternative. An excellent summary of the discussions and the directions that were set at the conclusion of the workshop are documented in the workshop notes published by the NOAA Project Manager, January 15, 1999. For purposes of this discussion, reference is made to *HLRP Conceptual Design Workshop Notes - Day Two*, pages 3-5, and 8. The diagrams included on page 8 of the *Notes* reflect the final allocation of spaces for the floor layouts developed at the conclusion of the week-long workshop. The listing below summarizes the assignments for each of the floors of the four-story Demolition and Reconstruction Alternative as they were envisioned at that time.

Ground Floor
- Public Reception/Information
- Administration and Editorial Offices
- Seminar/Conference/Exhibit Facilities and related Storage
- Staff Lunchroom and Catering Kitchen
- Central Receiving/Shipping
- Dive Locker
- Wet Laboratories, Necropsy Laboratory, Specimen Storage, Freezer/Refrigeration Units
- Trash/Recycling Center
- Hazardous Materials Storage (separate service structure)

Second Floor
- Maintenance Shops and Material Storage (at freight elevator)
- General Storage
- Staff Exercise and Locker/shower
- Library
- Fishery Monitoring & Economic Performance (FMEP)
- Western Pacific Fishery Information Network (WPacFIN)
- Fishery Data Management Program (FDMP)

Third Floor	Law Enforcement Information & Technology Services (ITS) Ecosystem & Environment Investigation (EEI) Protected Species Investigation (PSI)
Fourth Floor	Fish Biology & Ecology Investigation (FBEI) Stock Assessment Investigation (SAI) Laboratory Director's Office Pacific Islands Area Office (PIAO)

2. Detailed Assignments by Level

Parking Level. A total of 126 spaces is provided on the below-grade parking level. Primary access is directly from Dole Street; a ramp to the mauka (north) provides a second means of egress through the building's service area to Pope Road and East-West Campus Drive.

Ground Floor. All of the basic building service areas are accommodated on the ground floor with convenient access to the receiving areas and freight elevator, including the shops and materials storage areas previously considered for a second-floor location; the primary laboratories, specimen storage rooms and freezer/refrigeration units are grouped along the primary mauka-makai (north-south) service corridor; the staff lunchroom and catering kitchen open out to stream-side lanais; the kitchen serves a conference room and lanai associated with the seminar facilities. The seminar rooms will be jointly used by the SWFSC and the PIAO, and are designed with separate access from the entrance courtyard. The two rooms are divided by a movable wall, and can be combined for larger assemblies or other functions. The rooms have windows along the east (Diamond Head) side of the building that look out to views of the stream. Administrative and Editorial offices are combined in an open-office arrangement on the makai wing along the Dole Street frontage.

Both building elevators serve the below-grade parking level.

Site Features. The primary visitor entrance court includes a covered portico and accessible entry from Dole Street; all accessible parking spaces are grouped on grade near this main entrance; a visitor information/reception area is immediately adjacent to the visitor drop-off. A lawn area for outdoor recreational activities is immediately mauka (north) of the entrance court along the ewa (west) side of the building; farther mauka (north) the shop facilities open out to a walled service court/fabrication yard. A central reception court, intended to serve as an outdoor exhibits and reception court for the seminar and conference facilities is immediately Diamond Head (east) of the car court. The courtyard is inside the fence line and entry gates; access to the area can be controlled during the evening hours.

A total of 15 parking spaces is provided on the ground level: 11 visitor spaces (including five handicapped spaces) are on the ewa (west) side of the building serving the building's main entrance; four spaces are in the service area mauka (north) of the building.

Second Floor. Staff services, including locker/showers, exercise facilities, field services workrooms, and the PIAO Observer Program equipment storage room are grouped in a central Staff/Field Services Center in the mauka-ewa (northwest) portion of the second floor. The largest block of warehouse storage (FBEI, EEI, and PSI) is located along the mauka (north) side of the building immediately adjacent to the freight elevator and directly above the receiving areas on the floor below. The offices/supporting facilities assigned to FDMP and WPacFIN are arranged along the primary mauka-makai (north-south) corridor. This segment of the corridor opens out to the Diamond

Head (east) to a second-floor lanai. It overlooks the lawn and landscaped areas on the ground level below and is connected to these areas by an outdoor stair. This lanai and the lawn area serves as a potential staging area for use by Observer Program and PSI Field Camp personnel. The facility's main library is located on the makai (south) side of the primary elevator and stair, directly above the seminar/conference facilities on the floor below. The library's meeting room opens out to a lanai. The block of offices assigned to FMEP are arranged along the makai (south) wing.

Third Floor. Starting on the mauka (northern) portion of the floor, offices for Enforcement are located on the ewa (west) side; the ITS High Tech offices and CoastWatch satellite receiving laboratory are on the mauka (north) end. The main ITS offices and the central computer facilities are arranged along the buildings main mauka-makai (north-south) corridor. Offices for EEI are next on the Diamond Head (east) side of the building, arranged around the central elevator core. PSI offices complete the floor and are assigned the entire makai (south) wing.

Fourth Floor. FBEI is assigned the entire mauka (northern) portion of the floor; SAI, the Laboratory Director's Office are next along the main mauka-makai (north-south) corridor. The offices for PIAO occupy all of the remaining floor on the makai (south) side of the central elevator core.

D. COMPARISON OF PROGRAMMED AND AS-DESIGNED BUILDING AREAS

1. Definitions

The facilities requirements program is comprised of net floor area assignments to office, office support, special space (e.g., laboratories, seminar rooms, etc.), and storage areas. Multipliers are used in the program to: a) estimate floor area required for internal circulation, interior walls, and layout inefficiencies within the assignable office and support areas; and b) estimate the building areas required for the “nonassignable” areas; i.e., toilets, stairwells, elevators, building equipment and service areas, elevator lobbies, mechanical stacks and shafts, and required building corridors and exit ways.

Assignable office, office support, special and storage areas: For the purpose of estimating the floor area required for internal circulation, walls, and inefficiencies in layout within various office areas, the programmed net room and open office areas were increased by a factor of 15 percent; for the joint use and public reception areas the allowance was 10 percent; and for storage, supporting areas, and building services the allowance was 5 percent. In the current version of the building program the estimated required assignable area, including the above allowances for internal circulation and layout, totaled 6243 sq. m [67,200 sq. ft.]. This total includes 6002 sq. m [64,600 sq. ft.] for office, office support, and special function areas; and 242 sq. m [2600 sq. ft.] for warehouse-type storage areas.

Gross building area: The subtotal for office, office support, and special functions areas was increased by a factor of 30 percent and the subtotal for storage areas was increased by 10 percent for the purposes of estimating the overall, or gross, building area required to accommodate the building program. Some service areas normally included in the calculation of the gross building area (e.g., toilets and building services) are itemized in the program document and were included in the assignable area estimate of 6243 sq. m [67,200 sq. ft.].

Based on the above assignments and allowances, the revised projected gross building area was estimated to be 8083 sq. m [87,000 sq. ft.].

The definition of *gross floor area* in the General Services Administration (GSA) Federal Property Management Regulations D-76 includes all floor area measured to the outer surface of the exterior building walls, including covered open porches, passages, and walks. However, the GSA definition counts covered, unconditioned areas at 50 percent of their actual value. The effect of these reduction in gross building area is discussed below as it relates to the two primary building alternatives.

2. Renovation/Addition Alternative

The total building area, including renovation of the existing Laboratory building and the proposed addition, is 9490 sq. m [102,000 sq. ft.]. Two levels of below-grade parking total 4140 sq. m [44,600 sq. ft.]. A take-off of the floor areas by floor, showing conditioned and covered (nonconditioned) floor areas, is provided in Table 1 below. The total building area in the Renovation/Addition Alternative as it is presently configured, including conditioned and covered (nonconditioned) floor area, is approximately 1410 sq. m [15,200 sq. ft.] more than the area estimated in the revised Facility Requirements Program.

Table 1: Take-off of Conditioned and Covered Building Area-Renovation/Addition Alternative

		Conditioned		Covered		Total	
	Element	SF	SQ. M	SF	SQ. M	SF	SQ. M
1	Parking Level B-1		0	22,300	2070	22,300	2070
2	Parking Level B-2		0	22,300	2070	22,300	2070
3	Subtotal-Basement Parking		0	44,600	4140	44,600	4140
4	Ground Floor	30,200	2810	600	60	30,800	2860
5	Second Floor	28,800	2680	2600	240	31,400	2920
6	Third Floor	26,300	2440	1200	110	27,500	2550
7	Fourth Floor	11,400	1060	1100	100	12,500	1160
8	Subtotal-Building	96,700	8980	5500	510	102,200	9490
9	Original Program					87,000	8080
10	Difference					15,200	1410
11	Pct difference					17.5%	

In Table 2 the "as-designed" areas in the current design for the Renovation/Addition Alternative are compared to the programmed building areas for each of the primary organizational components. The assignable floor areas in the current design (subtotaled in line 5) exceed the estimated requirements in the original program by approximately 19 percent. The assignable-to-gross ratio (shown in line 8), which is an indicator of the building's overall efficiency (at 78 percent), is actually slightly greater that the assignable-to-gross ratio estimated in the program document. If the GSA definition for *gross building area* is used, and the covered (nonconditioned) floor area is calculated at 50 percent of its actual value, the gross building area is reduced by 256 sq. m [2750 sq. ft.], which reduces the gross building area to 9239 sq. m [99,450 sq. ft.] and increases the calculated assignable-to-gross ratio to approximately 80 percent.

Table 2: Comparison of Programmed and As-Designed Area (SF)
Renovation/Addition Alternative

		Office+Special		Storage		Total			
		Program	Design	Program	Design	Program	Design	Diff	Pct
1	SWFSC	37,895	43,190	2050	2050	39,900	45,240	5340	13.4%
2	PIAO	6320	7670	300	350	6600	8020	1420	21.5%
3	Law Enforcement	2125	2440	300	340	2400	2780	380	15.8%
4	Shared/Joint Use	18,309	23,960			18,300	23,960	5660	30.9%
5	Subtotal: Assignable	64,650	77,260	2650	2740	67,200	80,000	12,800	19.0%
6	Net-to-gross conversion	19,395	22,200	265			22,200		
7	Total GSF	84,045	99,460	2915	2740	87,000	102,200	15,200	17.5%
8	Assignable-to-gross ratio	76.9%	77.7%			77.2%	78.3%		
9	Less unenclosed areas @ 50%						2,750		
10	Adjusted as-designed GSF					87,000	99,450	12,450	14.3%
11	Adjusted ratio					77.2%	80.4%		

3. Demolition and Reconstruction Alternative

A take-off of the building areas is provided for the Demolition and Reconstruction Alternative in Table 3. Similar to the figures for the Renovation/Alternative in Table 1, the "conditioned" and "covered" (nonconditioned) areas are listed separately for each floor. The gross "as-designed" building area (line 7) is approximately 9730 sq. m [104,800 sq. ft.], or approximately 1610 sq. m [17,800 sq. ft.]. This is approximately 20 percent more than the programmed overall building area of 8080 sq. m [87,000 sq. ft.].

Table 3: Take-off of Conditioned and Covered Building Area
Demolition and Reconstruction Alternative

		Conditioned		Covered		Total	
	Element	SF	SQ. M	SF	SQ. M	SF	SQ. M
1	Parking Level		0	41,400	3850	41,400	3850
2	Subtotal-Basement Parking		0	41,400	3850	41,400	3850
3	Ground Floor	24,600	2290	3585	330	28,185	2620
4	Second Floor	21,850	2030	4660	430	26,510	2460
5	Third Floor	22,100	2050	2940	270	25,040	2330
6	Fourth Floor	22,400	2080	2600	240	25,000	2320
7	Subtotal: Building	90,950	8450	13,785	1280	104,735	9730
8	Total: Original Program					87,000	8080
9	Difference					17,735	1610
10	Pct difference					20.3%	

In Table 4 the "as-designed" areas in the current design for the Demolition and Reconstruction Alternative are compared to the programmed building areas for each of the primary organizational components. The assignable floor areas in the current design (subtotaled in line 5) exceed the estimated requirements in the original program by approximately 19 percent. *Note that while the allocations to the four primary program components vary, the "as-designed" total at 7432 sq. m [80,000 sq. ft.] is the same as that calculated for the Renovation/Addition Alternative in Table 1.*

The assignable-to-gross ratio (shown in line 8), which is an indicator of the building's overall efficiency (at 76 percent), is slightly less than the assignable-to-gross ratio estimated in the program document. As in the case of the Renovation/Addition Alternative, if the GSA definition for *gross building area* is used and the covered (nonconditioned) floor area is calculated at 50 percent of its actual value, the gross building area is reduced by 650 sq. m [7000 sq. ft.], which reduces the gross building area to 9086 sq. m [97,800 sq. ft.] and increases the calculated assignable-to-gross ratio to approximately 82 percent. The adjusted gross building area exceeds the original programmed area by approximately 12 percent.

Table 4: Comparison of Programmed and As-Designed Area Demolition and Reconstruction Alternative

		Office+Special		Storage		Total			
		Program	Design	Program	Design	Program	Design	Diff	Pct
1	SWFSC	37,895	44,800	2050	2350	39,900	47,150	7250	18.2%
2	PIAO	6320	7600	300	300	6600	7900	1300	19.7%
3	Law Enforcement	2125	2400	300	300	2400	2700	300	12.5%
4	Shared/Joint Use	18,309	22,250			18,300	22,250	3950	21.6%
5	Subtotal	64,650	77,050	2650	2950	67,200	80,000	12,800	19.0%
6	Net-to-gross conversion	19,395	24,800	265			24,800		
7	Total GSF	84,045	101,850	2915	2950	87,000	104,800	17,800	20.5%
8	Assignable-to-gross ratio	76.9%	75.7%			77.2%	76.3%		
9	Less unenclosed areas @ 50%						7000		
10	Adjusted GSF					87,000	97,800	10,800	12.4%
11	Adjusted ratio					77.2%	81.8%		

4. Summary

The building floor areas summarized in Tables 2 and 4 for the SWFSC, PIAO, Law Enforcement, and Shared/Joint Use categories are based on take-off of the areas assigned to each investigation, the supporting areas, and the joint use areas. Itemized room-by-room comparisons have not been completed, and individual room assignments are shown on the accompanying concept design drawings. As a general observation, it appears that the designs generally match the original programmed areas for individual offices, workstations, office support spaces, laboratories, and support areas.

Several factors contribute to the differences observed in the "programmed" and "as-designed" concept designs. Following are preliminary observations:

Internal Circulation. The floor area required for internal circulation within the individual investigation office areas is considerably more than the total of 669 sq. m [7200 sq. ft.] originally estimated in the program document. It is estimated that a detailed take-off of the area devoted to internal circulation will range between 1394 and 1672 sq. m [15,000 and 18,000 sq. ft.]. The average percentage increase for internal circulation was 12.5 percent in the program; the actual is estimated to be 25 percent.

The efficiency of the office area layouts; i.e., the amount of floor area devoted to internal circulation, is affected by several factors including the width of internal hallways, the dimensions of the available floor area, and, to some extent, the ratio of private and open-office workstations. In all likelihood the factor used in the program document to estimate the required internal circulation was too low, given the relatively narrow, linear configuration of the property and the desire to maximize the potential for natural daylighting and access to the outdoor walkways. These potential inefficiencies in layout were not as apparent in the larger floor plates associated with the three-story options. The addition of a 6 percent “lay-out” factor in the original calculation would have more accurately predicted the actual “as-designed” building floor areas.

Mechanical/ Electrical/ Communications Service Rooms. Approximately 177 sq. m [1900 sq. ft.] were allocated for these service areas in the building program; the actual area in the case of the Demolition and Reconstruction Alternative is approximately 409 sq. m [4400 sq. ft.]—more than twice the area originally estimated. Again this overrun was effected, at least in part, by the decision to develop the four-story alternative. Service areas are required and occupy essentially the same area on all floors of the building.

Elements not included in the original program. The assignment of building areas in the schemes is determined at least in part by the overall configuration of the building. Even in a “best fit” situation some rooms and office areas will be larger (or smaller) than originally programmed. In this case, there are currently several “unassigned” areas (totaling less than 93 sq. m [1000 sq. ft.]) in the designs that contribute to the overruns on the assignable floor area calculations. In addition, the extent of covered walkways and the introduction of the lanais in the alternatives were considered desirable features but were not specifically included in the programmed floor areas. As an example, there are approximately 344 sq. m [3700 sq. ft.] of covered, but unconditioned, floor area associated with the entrance portico and lanais in the design for the Demolition and Reconstruction Alternative not specially planned for in the original building program.

No attempts have been made to develop a detailed comparison of the three- and four-story schemes. However, with respect to the four-story alternative there are obvious increases associated with the additional mechanical service areas, stairs, and elevators required to serve the additional floor. There also were efficiencies associated with the larger floor plates in the three-story scheme that were lost in the switch to the four-story option.

E. COMPLIANCE WITH ZONING REGULATIONS

Both the Demolition and Reconstruction and the Renovation/Addition alternatives are considered to be in conformance with the spirit of the City and County LUO. The proposed use is a permitted principal use in this zoning district. Both the minimum lot area and the minimum lot width are exceeded. Off-street loading requirements that apply to all zoning lots exceeding 465 sq. m [5000 sq. ft.] also have been exceeded.

Requirements for landscaping and screening will be met, and sunlight reflection will be addressed in the selection of building materials. Specifically, nonglare glazing will be chosen for the buildings.

1. Renovation/Addition Alternative

The existing Laboratory building encroaches on the front and ewa (west) side yards and it exceeds the height limit set in the current edition of the LUO. These nonconformities did not exist when the building was originally constructed. The current ordinance includes stricter setback requirements; in addition, a City and County street improvements project had the effect of reducing the building's front setback. As allowed in the ordinance, a waiver will be sought to continue use of the nonconforming structure.

Other nonconforming elements. The height of the proposed addition exceeds the allowable height limit. The height setbacks at the front, ewa (west) side, and rear yards also are exceeded. The generator and hazardous materials storage building encroaches on the rear yard setback.

While not in conformance with the above guidelines, the proposed design generally conforms with the spirit of the ordinance and the character of the surrounding buildings. The massing of the new structure has been designed to be consistent with that of its immediate neighbor, Burns Hall. All other buildings in the immediate neighborhood, including Gateway Hall, the EWC's Hale Manoa, and the reconstructed Frear Hall, are either equal to or greater in height than the proposed new Laboratory facility.

A waiver as described in §3.120(b)(4) will be requested for each of the above nonconformities, based on the premise that the scale of the building is consistent with that of its immediate neighbors.

The number of parking stalls provided also does not precisely meet the requirements of the LUO (§3.70). The number of stalls required is determined by floor area (as defined by Article 9) based on a given use (as defined in Table 3.1(A)). The ordinance does not provide a specific use that approximates “Laboratory.” The closest type of use has been assumed to be “Office.” This assumption has been confirmed by Mr. Harry Robbins of the City and County of Honolulu, Department of Planning and Permitting. The guidelines included in the ordinance for office uses (one space per 37 gross sq. m [400 gross sq. ft.]) have not been met.

In lieu of the LUO standards and methodology, the calculation of parking requirements used as the basis for design is based on projections of staffing with allowances for visitor and government-owned vehicles. A waiver will be requested to allow the nonconforming parking count.

2. Demolition and Reconstruction Alternative

As with the Renovation/Addition Alternative, the proposed new building conforms with basic land use guidelines. The use, lot size and coverage, off-street loading, landscape screening, and sunlight reflection are all either currently in conformance with the LUO or will be made to conform when specifically addressed. In addition, the front and side yard setbacks have been observed.

Nonconformity with the LUO occurs in three areas: heights and height setbacks, the rear yard setback, and off-street parking.

The height of the proposed new building, measured from grade to the peak of the roof, is roughly 18.3 m [60 ft.]. The height setbacks at the front, ewa (west) side, and rear yards also are exceeded. As in the case of the Renovation/Addition alternative, the generator/hazardous materials storage building is within the required rear yard setback.

Again similar to the Renovation/Addition Alternative, the parking count has been based on a percentage of projected staffing, with allowances for visitor and government-owned vehicles, rather than the per-square-foot calculation used in the LUO.

A waiver will be requested for each of the above nonconforming conditions.

V. ARCHITECTURAL DESIGN CRITERIA

A. Building Envelope

1. Wall Systems

Three basic systems will be used to finish the exterior vertical surfaces of the building: an exterior insulated finish system (EIFS), a curtain wall, and a metal railing and open corridor system. These systems are discussed below.

Exterior Insulated Finish System (EIFS)

The exterior insulated finish system (EIFS) will be applied to light-gauge metal framing. The EIFS will be continuous across the façade of the building. Expressions of the concrete superstructure will be limited to control and expansion joints located to maintain the integrity of the finish system.

Within the façade, below the fourth floor, “punched openings” will be created into which aluminum framed windows will be inserted. Each opening also will receive a stone or composite concrete sill. The windows will not, for the most part, be operable. Exceptions will be made where quick ventilation to the outside, such as in the laboratories, may be required from time to time.

At the fourth floor, a continuous band of windows will run from roughly +0.76 m [+2.5 ft.] off the floor to +2.6 m [+8.5 ft]. This set of windows will be differentiated from others by smaller panes and by being set slightly deeper into the face of the building.

Solar shading devices will be incorporated into both the façade and the window system. The shading devices will be constructed out of aluminum louvers. All windows facing Dole Street will be double glazed for noise attenuation.

The final element associated with EIFS system is a decorative sheet metal or cast composite concrete panel, used at the spandrel between the first and second floors where two-story surrounds have been used to group windows.

An example of this system is the Makai (South) Elevation of the Demolition and Reconstruction Alternative.

Curtain Wall

The second element used as part of the exterior building envelope is a glass curtain wall. Tinted, nonglare-producing glass will be used in a curtain wall framing system for the vision panels. Nonglare (and perhaps colored) glass will be used for the spandrel panel.

Louvered aluminum solar shading devices will be used across the length of the curtain wall, at each floor, to help reduce the solar load in the building.

As with the EIFS system, the structure of the building will not be expressed. Rather, the skin of the building is to be emphasized. An example of the system can be seen on the Manoa Stream side of each alternative, at the laboratories.

Metal Railing and Open Corridor Systems

The final exterior finish group occurs around the courtyards and along the open air corridors. This includes a 1.1-m [3.5-ft.]-tall metal railing on the outside of the open corridor and a 0.76-m [2.5-ft.]-tall “bench” with windows above on the inside, or office side, of the corridor. The cantilevered floor of each open corridor will be sealed concrete with a pattern sawcut into it.

2. Roof Systems

Roofing systems are divided into two distinct systems: for the sloped roof areas, and for the flat (low-slope) roof areas.

Sloped Roofs

The sloped roof is utilized in response to guidelines in the University's latest Long Range Development Plan (LRDP) that calls for sloping roofs on new buildings to match the character of C.W. Dickey's Wist Hall on the Lab School campus.

The sloped roof will be copper with plywood substrate over structural steel framing.

Flat (Low-slope) Roofs

The system to be utilized for the low-sloped (flat) roof area has not been determined.

B. BUILDING INTERIORS

1. Nonbearing Walls and Partitions

Nonbearing walls and partitions will be of reinforced concrete block in wet laboratory and service areas, and galvanized steel stud and gypsum drywall in office areas.

2. Stairs

Poured-in-place or precast concrete.

3. Finishes

Floor Finishes

Floor finishes shall include carpeting in office, conference, and meeting rooms; vinyl composition tile in office support and related service areas; sealed concrete in warehouse, shop and storage areas; epoxy-coated concrete in laboratories, ceramic tile in necropsy laboratory, shower and toilet rooms; raised accessible flooring in primary computer facilities; and special glazed tile in public lobby areas.

Wall Finishes

Wall finishes shall include painted drywall and concrete block in offices and service areas; vinyl wall covering in public lobby and corridors; painted epoxy in laboratories and wet areas; and ceramic tile in necropsy laboratory, toilets and shower rooms.

Ceilings

Ceilings shall include suspended acoustical lay-in ceilings in office and conference rooms, painted gypsum board or suspended acoustical lay-in ceilings in office support areas and service areas; and exposed structure in shop and warehouse storage areas.

Lighting

Lighting shall include ambient lighting throughout; supplemental task lighting in office, waiting areas, laboratories, and shops; and accent lighting in public areas, exhibits, and conference facilities.

C. SERVICES

1. Conveying Systems

Renovation/Addition Alternative. One new six-stop freight elevator serving the below-grade parking, service and Laboratory areas; and one, four-stop elevator with connecting corridor walkways to the existing Laboratory building.

Demolition and Reconstruction Alternative. Two new five-stop elevators serving the below-grade parking level and the four Laboratory/office floors. The elevator serving the mauka (northern) portion of the building will be a freight elevator.

2. Specimen Storage Areas

The specimen storage areas should be designed as hazardous materials storage areas that meet the standards for storing flammable liquids. Many samples are stored in isopropyl alcohol of up to 70 percent concentration, or in ethanol alcohol of up to 95 percent concentration. These storage environments are solutions with NFPA flammability hazard rating 3.

The rooms holding these chemicals need to be designed so that there is no need to install individual, flammable-material cabinets within them. Samples are kept in formaldehyde solutions of between 2 percent and 4 percent concentration, which are not flammable but have an NFPA health hazard rating of 2.

D. EQUIPMENT AND FURNISHINGS

1. Equipment

Seminar/conference facilities. The public and common use areas will serve a variety of functions. Some primary functions include international conferences, scientific seminars, workshops, staff parties, receptions, public hearings/meetings, school group visits, training, general staff meetings, and video conferences. The exhibit areas will be used for a variety of presentations including displays of current Laboratory research, teaching, displays of artistic/historic exhibits relative to the Laboratory's work, and poster sessions. Equipment to be accommodated in support of these activities includes the following:

- translation equipment
- sound amplification equipment
- audio and video taping equipment

- video projection equipment
- video production equipment
- overhead projection equipment
- computer projection equipment
- slide projection
- video teleconferencing
- word processing/photocopy equipment
- easels
- projection screens
- video monitors

There will be requirements for lighting (including track display lighting, spot lighting, and variable general lighting) and for electrical, data, telephone, and cable television connections. Securable storage will be required for all of the above equipment.

Food service and preparation equipment will include ice makers, coffee service, food preparation, refrigerated and dry storage, and vending equipment.

Displays. Provisions should be made in selected locations along building corridors for the display of art and other informational materials. Weather protection should be considered for displays along exterior corridors.

2. Furnishings

Seminar/conference facilities will require tables, stacking and conference chairs, general seating, movable dais staging, lecterns, and display tables. Blackout curtains and blinds will be required.

VI. LANDSCAPE DESIGN CRITERIA

A. COMMON ELEMENTS

The emphasis of the landscape design for both alternatives is focused on blending the building and the site with the rest of the University campus, through the use of mature palm trees along the Dole Street frontage and segments of the interior driveways.

Both alternatives take measures to discourage crossing of NMFS and East-West Center property by pedestrians on their way between the University's Upper and Lower Campuses. To prevent pedestrians from passing between Pope Road and the East-West Center's driveway off of Dole Street, both alternatives use planting and screening walls near the rear of the property that is between the lab facility and Burns Hall. In addition, hedges and planting beds are employed in both alternatives, to deter pedestrian access from Dole Street along the top of the streambank.

Planting and paving will be carefully selected to assist in maintaining the stability of the bank top. The bank itself and the streambed below will be left undisturbed.

B. RENOVATION/ADDITION ALTERNATIVE

In the yard fronting Dole Street, the existing low rock wall that runs the width of the property along the sidewalk will be retained. The area between the rock wall and the existing Laboratory building will be planted with foundation planting and hedges to soften the structure's visual impact.

In the existing parking area between the existing Laboratory building and Burns Hall, the vehicle entry will be emphasized by the introduction of a large canopy tree and perimeter planting against the building foundation.

At the top of the streambank, the space between the existing lab structure and the top of the slope will be exploited to form an informal, semiprivate gathering place for the staff and visitors. Random pavers will be used to define the space and to provide a protected walking surface.

C. DEMOLITION AND RECONSTRUCTION ALTERNATIVE

The front yard is treated in a formal manner with geometric lawn and planting bed patterns, which add a sense of order as well as provide a planting foundation along the base of the building.

A landscape courtyard is provided between the building and the driveway parking area. Large shade trees are provided for site aesthetics as well as to create a place for informal gatherings.

The top of the streambank consists of an informal walkway system that will enable users to enjoy the stream environment in a semiprivate setting. Hedges are used to establish privacy from Dole Street.

VII. STRUCTURAL DESIGN CRITERIA

A. General

Structural design shall comply with the *Honolulu Amendments to the Uniform Building Code* (*Building Code*), latest edition, and that edition of the *Uniform Building Code* (*UBC*) currently adopted. At this writing, the latest edition of the *Building Code* is 1997, which adopted the 1994 *UBC*. It is anticipated that the next edition of the *Building Code* will be published in 2000 and will adopt the 1997 *UBC*. The *Building Code* is typically updated on a cycle of approximately three years, to match the *UBC* publication cycle; however, at this time there is no published schedule for adopting the 2000 *UBC*.

In addition to the *UBC*, the design shall comply with National Earthquake Hazards Reduction Program (NEHRP) publications. These publications include *Recommended Provisions for the Development of Seismic Regulations for New Buildings* (1994) and *NEHRP Handbook for the Seismic Evaluation of Existing Buildings* (1991).

B. Building Type

The selection of construction materials and structural systems for the new facility is based in part on requirements of the *UBC*, which classifies buildings according to type of use. Laboratory and office buildings with occupancies similar to those programmed for the main Laboratory facility are classified by the *UBC* as Group B Occupancies. The large assembly room within the building will be considered a Group A3 Occupancy. Given this mix of occupancy classifications, and the overall floor area programmed for the building, it is likely that the structure will be designed to conform to *UBC* requirements for "Type II fire-resistive" or "Type II one-hour" construction.

For Type II construction, the building must be of structural steel, concrete, or masonry. Masonry was eliminated from detailed evaluation, since a masonry wall system is desirable in a bearing wall structural system and does not easily lend itself to a building frame system of variable floor plans. This lack of adaptability to a nonuniform /irregular floor plan—and, therefore, framing—is amplified when the superstructure (Lab/Office Tower) has a different layout than that of the substructure (Underground Parking) that requires open layout for traffic flow.

Two superstructure construction options were evaluated to a much greater extent: steel, and concrete.

1. Steel Superstructure

In recent years, the trend in demolition and reconstruction has been an increasing number of steel structures. However, steel does not seem to be the construction material of choice for low-rise structures at this point in the local economy.

The Laboratory building superstructure system should be designed to minimize vibration that is transmitted to the Laboratory equipment. Because of steel's comparatively lower mass, steel structures exhibit a higher level of vibration transmission than concrete structures.

2. Concrete Superstructure

Carpenters form a strong union in the Hawaiian Islands, as well as a larger presence: Carpenters comprise most of the labor force in concrete formwork and construction. Thus, from a socioeconomic standpoint concrete is the construction material of choice. Concrete is the optimal construction material from an environmental perspective also, considering Sustainable Design Guidelines. Because concrete is produced locally, its use minimizes overall consumption of energy during production and construction.

Construction scheduling also can benefit from the use of concrete. Because it is readily available, concrete promotes a faster construction schedule in two ways. One, it minimizes the possibility of material shortages. Two, it minimizes the long lead-time requirements for materials, such as structural steel, that must be imported—often from foreign countries, as a result of domestic material cost and availability.

Concrete structures exhibit a lower level of vibration transmission and/or vibration susceptibility, due to concrete's greater mass (weight). These vibration characteristics of concrete make it a more suitable construction material than steel for the everyday operation of the laboratories, due to their requirement for a vibration-free environment.

The conclusion of our preliminary investigation and inquiry of steel vs. concrete—to favor concrete—was confirmed by the VE team, Olympic Associates Company, when it recommended the use of concrete in lieu of steel for this Laboratory Renewal project. All concrete shall attain a 28-day compressive strength of 27 579 kPa [4000 psi].

C. MINIMUM LIVE LOADS

Roof Load

1 kPa [20 lb/sq. ft.]

Floor Loads

Parking Areas	2 kPa [50 lb/sq. ft.] LL
Office Areas	2 kPa [50 lb/sq. ft.] LL+1kPa [20 lb/sq. ft.] partition load
Special Use Areas **[1]**	5 kPa [100 lb/sq. ft.] LL + 1kPa [30 lb/sq. ft.] equipment + 1kPa [20 lb/sq. ft.] partition load
Assembly Areas	5 kPa [100 lb/sq. ft.]
Corridors and Stairs	5 kPa [100 lb/sq. ft.]
Light Storage	6 kPa [125 lb/sq. ft.]

[1] Special Use areas are as follows: receiving/shipping, material storage, tool room, wood and material shop, storage, necropsy lab, freezers, specimen storage, wet processing lab, library, work room, reading room, library stacks, map storage room, records storage, archived data storage, field camp work room, Observer Program workroom, PIAO Observer Program storage, electronics shop, exercise equipment room, warehouse storage, FDMP archived data storage, HLML archives, media storage, current data storage, electronic equipment storage, ADCP shop, data storage, AV lab, chemistry lab, FBEI storage, lab office, PSI storage, LO, micro labs.

D. LATERAL FORCES

Wind Load - Basic Wind Speed 129 kph [80 mph]; exposure B.

Seismic Design Load - Seismic Zone 2A, Occupancy Category 3.

E. FOUNDATION/SUBSTRUCTURE

The Hawaiian Islands are volcanic in origin and have shallow basalt bedrock in many areas. Geotechnical exploration of the site indicates a very hard layer of basalt rock at the existing NOAA site (Dames& Moore, Geotechnical Investigation, Proposed NMFS Honolulu Laboratory Renewal Project, August 18, 1998).

The proposed buildings with basements should be supported entirely on shallow footings on the underlying massive basaltic rock. Excavation in soils and clinker material can be done with conventional earth-moving equipment such as dozers and excavators. Cobbles and boulders should be expected within the upper 1.5 to 2.7 m [5 to 9 ft.]. Additional excavations into the underlying massive basaltic rock may require use of a large bulldozer with ripping attachments, a hoe ram, hydraulic splitters (or various combinations of them), depending on the success of the blasting effort.

To reduce differential settlements, the foundation for the proposed NMFS Honolulu Laboratory should be supported on the underlying dark gray massive basaltic rock. The loose rocks caused by blasting should be removed prior to construction of the footing. Sections with overbreaks may have to be filled with concrete. The footings should be designed for a maximum bearing pressure of 478.8 kPa [10,000 lb/sq. ft.] and have a minimum width of 30.5 cm [12 in.]. The bearing pressure may be increased by one-third, for resisting seismic and wind forces. Settlement of the foundation founded on the basaltic rock will be minimal. The edge of the building should be set back along Manoa Stream at a distance such that an imaginary 45-degree line can be drawn from the base edge of the footing to the toe of the streambanks.

The elevator footing in the Renovation/Addition Alternative would be located within the existing courtyard. The 1949 grading plan indicates that the center of the courtyard was filled 0.61 m [2 ft.]. We therefore recommend that the foundation be bearing on firm, undisturbed, natural soil possibly found at a minimum depth of 1.22 m [4 ft.] below the surface. The foundation bearing on the natural soil may be designed for a maximum bearing pressure of 143.6 kPa [3000 lb/sq. ft.].

1. Demolition and Reconstruction Alternative

Typical interior footings supporting the office/Laboratory floors are 2.74 m × 2.74 m × 0.61 m [9 ft. × 9 ft. × 2 ft.] deep, with No. 9 reinforcing bars at 228.6 mm [9 in.] on centers (o.c.) in each direction.

Typical exterior footings supporting the office/Laboratory floors are 2.13 m × 2.13 m × 0.53 m [7 ft. × 7 ft. × 1.75 ft.] deep, with No. 8 reinforcing bars at 304.8 mm [12 in.] o.c. in each direction.

Typical exterior wall footings to support the ground floor framing and the below-grade concrete retaining walls are 0.61 m [2 ft.] wide × 304.8 mm [12 in.] deep; continuous, with No. 4 reinforcing bars at 304.8 mm [12 in.] o.c. in each direction.

Typical perimeter concrete walls are 304.8 mm [12 in.] thick with No. 4 reinforcing bars at 304.8 mm [12 in.] o.c. each way, each face.

Typical slab-on-grade configuration is 127-mm [5-in.]-thick concrete slab with No. 4 reinforcing bars at 406.4 mm [16 in.] o.c. each way.

Reinforcing used in the exposed deck at the main entry area shall be epoxy-coated for corrosion protection.

2. Renovation/Addition Alternative

Typical interior footings supporting the office/Laboratory floors and the upper parking level are 3.05 m × 3.05 m × 0.61 m [10 ft. × 10 ft. × 2 ft.] deep, with No. 9 reinforcing bars at 177.8 mm [7 in.] on centers (o.c.) in each direction.

Typical exterior footings supporting the office/Laboratory floors and the upper parking level are 2.44 m × 2.44 m × 0.53 m [7 ft. × 7 ft. × 1.75 ft.] deep, with No. 8 reinforcing bars at 304.8 mm [12 in.] o.c. in each direction.

Typical exterior wall footings to support the ground floor, the upper parking-level floor, and the below-grade concrete retaining walls are 0.61 m [2 ft.] wide × 304.8 mm [12 in.] deep; continuous, with No. 4 reinforcing bars at 304.8 mm [12 in.] o.c. in each direction.

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Typical slab-on-grade configuration is 127-mm [5-in.]-thick concrete slab with No. 4 reinforcing bars at 406.4 [16 in.] o.c. each way.

F. SUPERSTRUCTURE

Reinforcing bars are subject to corrosion in concrete structures, especially in a saltwater environment. In such an environment it is recommended that concrete cover over the reinforcing be greater than minimum. A dense concrete with fly ash or slag cement replacement will significantly improve the corrosion-protection properties of concrete. Additives also will be used to improve concrete’s corrosion-protection properties.

A concrete structure would consist of floor systems of cast-in-place beams spanning shear walls, or concrete girders supported by columns. Such a structure would provide a stiff, low-vibration floor with excellent sound-transmission qualities.

Concrete deck framing also will be provided in the attic floor area, only where required for mechanical equipment.

1. Demolition and Reconstruction Alternative

Due to the requirements for flexibility necessary to accommodate future renovations and modifications, a joist-and-beam floor-framing system was selected over a post-tensioned slab system. Generally, joist-and-beam systems allow greater flexibility to revise the floor renovations such as openings, etc. Also, these systems exhibit superior vibration-damping characteristics.

Special Use Area

Framing consists of 114.3-mm [4.5-in.]-thick concrete slab reinforced with No. 3 reinforcing bars at 304.8 mm [12 in.] o.c., perpendicular to joists.

Slabs are supported by joists,520.7 mm [20.5 in.] deep × 152.4 mm [6 in.] wide (406.4-mm [16-in.] rib height and 114.3-mm [4.5-in.]-thick slab), spaced at 914.4 mm [36 in.] o.c., with two No. 6 bottom and No. 6 top reinforcing bars at 304.8 mm [12 in.] o.c.

Joists are supported by concrete beams, 711.2 mm [28 in.] deep × 508 mm [20 in.] wide, with three No. 8 bottom and four No. 11 top reinforcing bars.

Office Area

Typical floor/office area framing consists of 76.2-mm [3-in.]-thick concrete slab reinforced with No. 3 reinforcing bars at 304.8 mm [12 in.] o.c., perpendicular to joists.

Slabs are supported by joists, 431.8 mm [17 in.] deep × 152.4 mm [6 in.] wide (355.6-mm [14-in.] rib height and 76.2-mm [3-in.]-thick slab), spaced at 914.4 mm [36 in.] o.c., with two No. 5 bottom bars and No. 5 top reinforcing bars at 279.4 mm [11 in.] o.c.

Girders are 431.8 mm [17 in.] deep × 762 mm [30 in.] wide.

Parking Area

Parking floor framing consists of 114.3-mm [4.5-in.]-thick concrete slab reinforced with No. 3 reinforcing bars at 304.8 mm [12 in.] o.c., perpendicular to joists.

Slabs are supported by joists, 419.1 mm [16.5 in.] deep × 152.4 mm [6 in.] wide (304.8-mm [12-in.] rib height and 114.3-mm [4.5-in.]-thick slab), spaced at 914.4 mm [36 in.] o.c., with two No. 5 bottom bars and No. 5 top reinforcing bars at 279.4 mm [11 in.] o.c.

Girders are 419 mm [16.5 in.] deep × 762 mm [30 in.] wide.

Typical columns supporting the girders are 406.4 mm [16 in.] × 508 mm [20 in.], with eight No. 11 reinforcing bars.

2. Renovation/Addition Alternative

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Girders are 419 mm [16.5 in.] deep × 762 mm [30 in.] wide.

Typical columns supporting the girders are 406.4 mm [16 in.] × 508 mm [20 in.], with eight No. 11 reinforcing bars.

G. LATERAL LOAD-RESISTING SYSTEM

1. Demolition and Reconstruction Alternative

To maintain flexibility for future renovations and to accomplish an economical design, a strategically located shear wall system is selected.

Shear wall systems are generally more economical than moment-resisting frames (beams and columns designed to resist lateral loads), due to the additional detailing and additional reinforcing generally associated with moment-resisting frames.

The shear walls are strategically located at HVAC equipment rooms, elevator shaft/cores, and stair towers where the separation between areas is fixed and less likely to be subjected to possible future renovation. Shear walls are kept to the interior of the building, to minimize their impact on the exterior windows.

Shear walls consist of 254-mm [10-in.]-thick, concrete walls that are reinforced with No. 4 reinforcing bars spaced at 304.8 mm o.c., each way, each face.

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Shear walls consist of 254-mm [10-in.]-thick concrete walls that are reinforced with No. 4 reinforcing bars spaced at 304.8 mm o.c., each way, each face.

Due to the irregularity of the plan layout, it is necessary to mitigate performance problems associated with irregular structures that might arise during a seismic event. Seismic joints will be incorporated with the building, in an ewa-Diamond Head (west-east) direction, to separate the existing building structure from the new building structure. The portion of demolition and reconstruction directly over the existing structure will be tied to the existing structure, and additional shear walls will be incorporated for the additional lateral load requirement.

VIII. CIVIL DESIGN CRITERIA

A. General

Site improvement standards are applicable to both construction alternatives: Renovation/Addition, and Demolition and Reconstruction.

For both alternatives, elements of site access, paving materials, utilities, and site excavation are similar, with the exception of demolition and excavation requirements. Site demolition will cost less if the Renovation/Addition Alternative is selected, but a deeper and more expensive excavation will result. The following narrative identifies the basic elements of the Concept Design alternatives.

1. Site Access

Site access will be developed from Dole Street and from East-West Road, using Pope Road. Pope Road will be constructed to a width of approximately 15.85 m [52 ft.], accommodating both parallel and perpendicular parking and two, 3.05-m [10-ft.] drive lanes.

The Dole Street access will be improved to the extent possible, to improve disabled persons' access. Both access routes are applicable to each construction alternative.

2. Asphalt Pavement

Asphalt pavement for exterior parking areas, driveways, and roadways (including Pope Road) shall be 101.6 mm [4 in.] compacted thickness, consisting of two lifts. Pavement shall be placed on 152.4 mm [6 in.] of crushed rock, consisting of 101.6 mm [4 in.] of 38.1 mm [1.5 in.] minus and 50.8 mm [2 in.] of 15.8 mm [0.625 in.] minus leveling course compacted to 100 percent density.

The base course shall be on 254 mm [10 in.] of processed aggregate (gravel 100 percent passing a 76.2-mm [3-in.] sieve) and placed on in situ soil compacted to 95 percent maximum density for 254 mm [10 in.].

3. Concrete Sidewalks and Curbs

Concrete sidewalks and curbs shall be integrally cast, except where sidewalks do not abut the curb. In those places a 152.4-mm [6-in.]-high concrete curb and gutter section shall be placed. Unreinforced concrete sidewalks shall be 101.6 mm [4 in.] thick, broom finished, and jointed at a 6.1-m [20-ft.] grid with 1.52-m [5-ft.] maximum tool or sawn control joint.

4. Site Demolition and Clearing

Selected building demolition and general structure demolition shall be accomplished using equipment suitable for the purpose and techniques consistent with ordinances of the City and County of Honolulu. This equipment may include the following:

- Track hoe for vegetation demolition;
- Track hoe and boom with hydraulic impact hammer for concrete building demolition; and
- Building interior demolition will use smaller power equipment and air-powered hand tools.

Clearing shall include tree and stump removal and soil stripping.

5. Site Excavation

Building and trench excavation shall be accomplished with track-hoe excavators, and disposed off-site. Rock excavation shall be accomplished with controlled blasting that is designed for the specific excavation need.

We recommend that a blasting expert be employed by the Design Team, to write the rock excavating portion of the construction document specification.

6. Erosion Control

Site runoff will be collected and controlled. Sediments will not be permitted to leave the site or to enter either municipal or university drainage systems. Sediments will be collected in sediment basins or equipment designed for such purposes, meeting the standards of the City and County of Honolulu.

7. Site Drainage

The storm drainage volume for either construction alternative is imperceptibly different from the volume currently leaving the site. Building roof drainage will be collected in gutters and roof drains piped to the stormwater collection piping. Building foundation drains will be piped independently to the drainage system. Parking and roadway drainage will be collected in trapped catch basins prior to discharge to the drainage system. Yard drains will contain sediment traps and water piped to the drainage system.

The redeveloped Pope Road drainage will enter the existing University storm collection system, while the Laboratory site drainage will be collected and passed to the stormwater trunk in the Dole Street right-of-way.

A 10-minute maximum time of concentration will be used, producing a flow of approximately 0.11 cu. m [4 cu. ft.] per second. Under extreme flow conditions, a 0.3-m [1-ft.] surcharge is used, producing a velocity of 2.44 m [8 ft.] per second. A 0.91-m [3-ft.] per second self-cleaning velocity is maintained to minimize system maintenance.

8. Domestic and Fire Protection Water

Ductile-iron, restrained joint pipe is suggested for water service connections, for both construction alternatives. It will be extended from the 304.8-mm [12-in.] water main in Dole Street. A 152-4-mm

[6-in.] service with double backflow presenters and detector check meter will serve the building sprinkler system. The existing 50.8-mm [2-in.] water meter should remain for the domestic service. Building standpipe connections will be at the building surface.

A 203.2-mm [8-in.] water line will be extended from East-West Road, and a fire hydrant will be placed near the service entrance of the Laboratory building. A fire hydrant in this location will meet the requirements of reaching all external building locations with less than 91.4 m [300 ft.] of laid hose. Also, this hydrant placement will reduce response time significantly.

9. Temporary Parking—Grasscrete

As an element of the temporary parking and traffic mitigation measures during the construction, a part of the East-West Center’s lawn immediately mauka (north) of Pope Road may be used for temporary parking. This parking will accommodate the temporary loss of the East-West Center’s parking stalls along the Diamond Head (eastern) side of the East-West Center building.

Grasscrete will require a 152.4 mm [6 in.], compacted, crushed rock base. Grasscrete blocks will be manually installed on top of the crushed rock base, with predetermined spacers between the blocks. The space between blocks will be filled with approximately 51 mm [2 in.] of compacted sand and 51 mm [2 in.] of topsoil. This fill will then be seeded and watered, to promote grass growth

IX. MECHANICAL DESIGN CRITERIA

A. General

Mechanical design will be in accordance with the following codes and standards:

- Building Code of the City and County of Honolulu, October 1997 (1994 Uniform Building Code, as amended);
- Plumbing Code of the City and County of Honolulu, September 1996 (1994 Uniform Plumbing Code, as amended);
- Fire Code of the City and County of Honolulu, August 1992 (1988 Uniform Fire Code, as amended);
- State of Hawaii Applicable Regulations of the Department of Health and Department of Labor and Industry;
- Applicable Current Editions of NFPA Standards, ASHRAE Standards 15, 55, 62, and 90;
- Hawaii Model Energy Code, 1993; and
- Federal User's Manual, Performance Standards for New Commercial and High Rise Residential Buildings.

B. Air-conditioning and Ventilation

1. Design Conditions

Outside Temperatures	31 deg C [87 deg F) D.B./24 deg C [75 deg F] W.B.
Indoor Conditions	24 deg C [75 deg F] D.B./55% Relative Humidity (no specific humidity control needed due to the use of outdoor air pre-coolers).

2. Existing Air-conditioning System

This system includes a nominal 158-kW [45-ton] air-cooled chiller, with chilled water piped to a number of air-handling units and fan coil units. Because the system is less than three years old, air-handling units and fan coil units will be reused if they match the required capacities for some units in the new facility. The existing chiller is too small to suit the new facility.

3. Water Chillers

Water chillers will conform to the following specifications:

- Provide normal cooling for entire facility with two, water-cooled, helical rotary units using non-ozone-depleting refrigerant, selected for minimum IPLV (power consumption at varying loads);
- Recover some rejected heat, to preheat service water;
- Sized to provide approximately 60 percent of peak load each, to permit sustained operation during any maintenance outage;
- Rating-certified to meet ARI Standard 550;
- Located at garage level, on grade, with good vibration isolation to minimize any vibration problems in critical Laboratory areas;
- Seismic snubbers on vibration-isolating mounts; and
- Preliminary estimated cooling capacity of 630 kW (180 tons) each unit.

4. Cooling Towers

Cooling towers will conform to the following specifications:

- Induced draft crossflow type with axial flow fan, two cells, to permit continuing operation during maintenance;
- Fiberglass-reinforced plastic or stainless steel casing, stainless steel frame and basin, and plastic wet deck;
- Two-speed fan motors, for energy saving in very light load hours;
- Rating-certified to meet CTI Standard 201;
- Seismic bracing;
- Chemical treatment system; and
- Located at roof level, with good vibration isolation to minimize any vibration problems in critical Laboratory areas.

5. Condenser Water Pumps

Condenser water pumps will conform to the following specifications:

- One per tower;
- End-suction, flexible-coupled, base-mounted, with premium efficiency 4-pole motors, constant-speed; and
- Seismic snubbers on vibration-isolating mounts.

6. Chilled Water Pumps

Chilled water pumps will conform to the following specifications:

- Primary pumps—one per chiller, end-suction, flexible-coupled, base-mounted, with premium efficiency 4-pole motors, constant speed;
- Secondary pumps—two in parallel, end-suction, flexible-coupled, base mounted, variable speed drive; and
- Seismic snubbers on vibration-isolating mounts.

7. Chilled Water Piping System

Chilled water piping system will conform to the following specifications:

- Mains—Schedule 40 black steel, welded; small branches—Type L copper tube, brazed;
- All insulated with cellular glass, for long life with minimum maintenance;
- Provision for batch chemical feeding;
- Seismic bracing per SMACNA Seismic Restraint Manual, 2nd ed., 1998; and
- Ball valves up to 50 mm [2 in.]; butterfly valves for larger sizes.

8. Condenser Water Piping

Condenser water piping system will conform to the following specifications:

- Schedule 40 black steel, welded;
- Seismic bracing per SMACNA Seismic Restraint Manual, 2nd ed., 1998; and
- Butterfly valves.

9. Air-handling Units

Air-handling units will conform to the following specifications:

- Factory-assembled modular type;
- Insulated double-wall construction, galvanized steel;
- Drain pan of stainless steel construction;
- Chilled-water coil copper tube and aluminum fins per ARI Standard 410, epoxy-coated where in contact with outdoor air;
- Cartridge filters 65 percent efficient, with 25-percent-efficient pleated prefilters, per ASHRAE Standard 55-76;
- Fan forward-curved per ARI Standard 430, internally spring-isolated with seismic snubbers;
- Airflow monitoring station with factory-mounted damper;
- Motors premium efficiency;

- Air-handling units generally floor-mounted type in mechanical rooms on each floor;
- Outdoor air precooling units serving 24-hour occupied areas separate from outdoor air precooling units serving office-hour-occupancy. All constant-speed, with heat pipes or equivalent means for maximum dehumidification of outdoor air. Outdoor air quantities to conform to ASHRAE Std. 62. Locate in roof spaces;
- Air-handling units for Laboratory units—constant-volume, two-speed motors to permit energy conservation at unoccupied hours;
- Air-handling units for offices—variable-speed drive to serve variable-air-volume terminal units;
- Condensate drains—Schedule 80 PVC;
- Small air-handling or fan coil units for specific purposes such as computer room unit, elevator machine rooms;
- All air-handling units to have programmable control modules connected to the building energy management system, but capable of independent operation; and
- Chilled-water control valves—two-way modulating.

10. Ventilating Systems

Ventilating systems will conform to the following specifications:

- Garage exhaust ventilation fans with CO monitors to permit reduction in airflow with low vehicular traffic;
- Noncritical area exhausts interlocked with air-conditioning systems. Hot areas ventilated to restrict temperature rise to 5 deg C [9 deg F];
- Laboratory fume hood exhausts with variable air volume makeup and exhaust. System design to conform to NFPA 45-1996, with fans at roof level. Laboratories at negative pressure at all times, exhausts run 24 hours per day;
- Laboratory snorkel exhausts run manually as needed;
- All fans AMCA-rated;
- Fume exhaust fans of stainless steel construction; and
- Exhaust discharges will be well-separated from outdoor air intakes, as required by Code.

11. Ductwork

Ductwork will conform to the following specifications:

- SMACNA Duct Construction Standards, Metal and Flexible, 2nd ed., 1995;
- All fume exhaust, other corrosive exhaust ducts, and outdoor air intake ducts of stainless steel construction;
- All supply, return, and ordinary exhaust ducts of galvanized steel construction, with flexible duct connections to air diffusers;
- Pressure class and seal class of ducts appropriate to the service; and

- Supply-air ducts lined with 25-mm [1-in.]-thick, mat-faced, fiberglass duct liner for acoustical and thermal insulation.

12. Variable Air Volume Terminal Units

Variable air volume terminal units will conform to the following specifications:

- For very small zones—DDC-controlled diffusers;
- For all other zones—pressure-independent, single-zone, lined, DDC-controlled terminal units, ARI performance certified; and
- Zone temperature sensors.

13. Backup Cooling System for Main Computer Room

The backup cooling system for the main computer room will conform to the following specifications:

- Split system, air-cooled, direct expansion type; on emergency power;
- Epoxy-coated, air-cooled condensing unit; and
- Flexible elastomeric insulation on piping.

14. System Controls

System controls will conform to the following specifications:

- Building Energy Management System (BEMS); with PC having graphical operator interface, and modem for remote monitoring;
- BEMS shall be BACNET compliant;
- Provide event log, energy usage reports, trend log, maintenance messages, and scheduling;
- Factory-mounted, microprocessor-based, programmable control modules on chillers, air-handling units, VAV terminal units, specialized air-handling and fan coil units;
- All fans monitored;
- Each perimeter office will be a separately-controlled zone, per the client’s request. It has been agreed that perimeter windows will not be operable; and
- BEMS will also indicate HECo power failure, if generator is running, generator low fuel level, and fault on the main UPS.

C. PLUMBING AND OTHER PIPED SYSTEMS

1. General

Plumbing and other piped systems shall conform to the Plumbing Code of the City and County of Honolulu, October 1997, and the Hawaii Model Energy Code, 1993.

Hot water will be provided in all rest rooms and laboratories.

2. Fixtures and Equipment

All fixtures and equipment shall be of standard commercial quality. Specifications for particular items are as follows:

- Water Closets—vitreous china, elongated bowl, siphon-jet, 5.9 liters [1.6 gallons] per flush, automatic flushometer valve; handicap closets 450 mm [18 in.] high;
- Lavatories—countertop, low-flow automatic faucet, cold water only except for laboratory or other special requirement; handicap lavatories, wall-hung;
- Urinals—wall-hung, 3.7 liters (L) [1 gallon] per flush, automatic flushometer valve;
- Service sinks, mop sinks, sinks, safety showers, other special fixtures as required;
- Electric Water Cooler—nominal 18 L/hour (5 gallons/hour) twin units, wheelchair-accessible;
- Water Heaters—high-efficiency gas or heat pump, preheated by heat reclaim from chillers;
- Storage Tank—insulated, cement-lined, seismically restrained; and
- Return Water Pump—bronze, in-line, circulating pump.
- Garbage Disposals—stainless steel casing, cast-alloy shredders, reversing action, 1 HP.

3. Piping

Specifications for piping are as follows:

- Service Cold Water and Hot Water—Type L copper; hot water insulated to conform to Hawaii Model Energy Code;
- Regular Waste and Vent—no-hub cast iron;
- Acid Waste and Vent—polypropylene with no-hub couplings above grade. High-silicon iron or polypropylene below grade;
- Compressed Air—Type L copper;
- Gas—Schedule 40 black steel above grade, wrapped Schedule 40 black steel or polyethylene below grade;
- Diesel—Schedule 40 black steel above grade, double-wall fiberglass below grade;
- Laboratory Vacuum—Type L copper;
- Distilled Water—polyvinyl chloride (PVC); and
- Large Pipe—seismically braced per SMACNA Seismic Restraint Manual, 2nd ed. 1998.

4. Valves

Specifications for valves are as follows:

- Service Cold Water and Hot Water—generally, bronze ball valves up to 50 mm [2 in.]; iron gate valves in larger sizes;
- Compressed Air—bronze ball valves;
- Gas—steel gas cocks;
- Diesel—bronze ball valves;
- Laboratory Vacuum—bronze ball valves; and
- Distilled Water—nonmetallic ball valves.

D. FIRE PROTECTION

1. General

Dry standpipes, fire department connections, and valves shall be in accordance with the City and County of Honolulu Building Code, and the Fire Code of the City and County of Honolulu.

2. Automatic Fire Sprinkler System

Specifications for the automatic fire sprinkler system are as follows:

- Wet-pipe per NFPA Standard 13 including seismic bracing, and Honolulu Fire Department requirements including fire pump and fire department connection;
- Gaseous fire extinguishing systems, for specifically designed areas including Coast Watch Room and computer room;
- Pre-action systems, in elevator machine rooms;
- Fire extinguishers per the Building Code of the City and County of Honolulu; and
- Fire pump.

X. ELECTRICAL DESIGN CRITERIA

A. GENERAL

Electrical design will be in accordance with the following codes and standards:

- Building Code of the City and County of Honolulu, October 1997 (1994 Uniform Building Code, as amended);
- Electrical Code of the City and County of Honolulu, September 1996 (1996 National Electrical Code, as amended);
- Fire Code of the City and County of Honolulu, August 1992 (1988 Uniform Fire Code, as amended);
- Applicable current editions of National Fire Protection Association standards;
- Hawaii Model Energy Code, 1993; and
- Federal User's Manual, Performance Standards for New Commercial and High Rise Residential Buildings.

B. POWER AND LIGHTING

1. Commercial Power

Normal service to the building will be served by Hawaiian Electric Company (HECo) through a dedicated HECo transformer located on the project site. A radial feed primary will be requested from HECo. Service from HECo will be at 480/277 volts, three-phase, four-wire with most of the building load at this voltage. Primary ductline, transformer pad, and secondary service lateral will be in accordance with HECo requirements.

A detailed investigation into providing a feed to the building from the UH substation will be carried out. Results of the investigation could possibly reduce power cost and give higher power reliability.

2. Standby Power

A diesel-engine-driven generator will be provided to furnish power in case of commercial power failure. The packaged diesel-engine generator system will be a self-contained unit with a day tank for 48 hours of run time at full load, starting system, critical rated silencer, and exerciser. Automatic transfer switch(es) will be provided to transfer between normal and standby power.

The following conditions will register at the Building Energy Management System (BEMS):

- Power out;
- Generator running, and
- Low fuel.

Expected demands include the following:

- Life safety and egress lighting, and life support equipment both for occupants and critical systems;
- Critical ventilation equipment and related controls;
- Monitoring and control equipment;
- Occasional receptacles in selected laboratories, for use with small aquariums and critical computers;
- Specimen freezers and ultra freezers;
- UPS systems supporting main computer and CoastWatch Program computer servers;
- Backup cooling system for the main computer room;
- Equipment associated with satellite communications;
- Critical system alarms;
- Building life safety systems; and
- Security and access control systems.

Minimum generator capacity will be 100 kW.

3. Uninterruptible Power Supplies

Uninterruptible power supplies (UPSs) will be provided in the main computer and CoastWatch server rooms. UPS systems will have lead calcium batteries with manual bypass switch.

The client will supply local UPS systems where they are needed at critical workstations. Since the UPS will be floating on the normal distribution system, the regulated power output could be supplied at all times. The regulation would include voltage stabilization and normalization, frequency regulation, and transient voltage suppression to pass ANSI/IEEE C62.41 categories A and B.

4. Power Distribution

Power distribution will be in accordance with the following:

- Service equipment will be in accordance with HECo requirements. Switchboard will be front-connected, front-accessible with silver-plated busses the entire length of the switchboard. Switchboard will be provided with provisions for future extension. Overcurrent protective devices will be circuit breaker type. Power will be distributed through a simple radial system;
- Wiring will be copper conductors, type THHN/THWN, in conduit (generally in metallic conduit in dry locations, and in rigid nonmetallic conduit in wet and where in contact with earth and concrete);
- Step-down transformers (480-208/120 volts, 3-phase, 4-wire) are to provide power mainly for receptacle loads. K-factor transformers where harmonic loads are anticipated;

- Panelboards will be surface-mounted in electrical rooms or areas with copper busses, bolt-on circuit breakers, and surge arrestors on the 480/277 volts panelboards. There will be 15 percent spares and panel capacity at completion of design work;
- Motor control centers will be similar to the switchboards, with Class II Type B wiring;
- Wiring devices will be specification grade; and
- Checkmeters will be provided in compliance with the Hawaii Model Energy Code.

C. LIGHTING

1. *Interior Lighting*

Interior lighting will comply with the Hawaii Model Energy Code. Sources generally will be fluorescent in office spaces, and high-pressure sodium in the garage. Lighting control generally will be by occupancy sensors in interior office spaces. Garage lighting will be time-switch controlled.

2. *Exterior Lighting*

Exterior lighting will comply with the Hawaii Model Energy Code. Generally, fluorescent lighting will be used at lanais, and high-pressure sodium fixtures will provide building-mounted, grade-level lighting. Landscape lighting will be incandescent. Lighting will be controlled by photocell or time switch.

D. TELECOMMUNICATIONS

1. *Commercial Telephone and Cable Television Services*

Commercial telephone service will be requested from GTE Hawaiian Tel; cable television service will be requested from Oceanic Cable. Provisions for their service laterals will be in accordance with the requirements of each utility company. Ductlines generally will be concrete-encased, Schedule 40, rigid, nonmetallic conduits with pullstring. Thirty-six telephone lines (“dedicated pairs”) will be requested from GTE Hawaiian Tel for their head end equipment. In addition, data links to UH will be provided as required.

2. *Cable Distribution*

Cable distribution generally will be in ceiling spaces, on fiberglass cable trays; with feeds to outlet jacks in walls or floors, in 19-mm [0.75-in.] conduit. Cables will be suitable for use in plenums used for environmental air. Telecommunications cabling will be terminated at the telecommunication outlet and patch panel, and tested and certified as usable.

3. *Telecommunication Outlet*

The telecommunication outlet will have jacks angled at 45 degrees from the wall. Each drop will contain the following cabling with appropriate jack:

- Voice—one, 4-pair, Category 3 cable;
- Data—two, 4-pair, Category 5 cables; and
- Data—one, multimode fiber cable with four strands.

4. Television

Provided provisions for cable television wiring will include empty raceways with pullstring, to accommodate an Owner-installed system. The Owner is to provide the design team with system requirements, so that provisions may be indicated on the Contract Documents. Video conferencing provisions will be provided in the following areas:

- Director's office;
- Conference rooms;
- Training rooms; and
- Enforcement office.

E. FIRE ALARM SYSTEM

The fire alarm system shall be a zoned, noncoded, addressable, microprocessor-based fire detection and alarm system. It shall include both manual and automatic initiation, addressable smoke detectors, and automatic alarm verification for alarms initiated by designated smoke detector zones.

F. INTRUSION DETECTION AND ACCESS CONTROL SYSTEM

The intrusion detection and access control system shall consist of door-switch and motion-sensor detection devices. Access control stations will be keypad type. Location of keypads (which doors, etc.) will be worked out with user groups.

XI. DIFFERENCES BETWEEN THE ALTERNATIVES

One of the primary goals of the Concept Design Phase is to select the alternative—Renovation/ Addition, or Demolition and Reconstruction—that will become the basis for design in the next phase of the work program. In making the final selection, a number of factors will be considered. These include findings and recommendations that will result from the completion of the Environmental Assessment (EA) and Value Engineering (VE) studies, to name just a few.

A summary of the primary architectural and programming differences between the two alternatives is provided below.

A. ARCHITECTURAL DESIGN ISSUES

The limited site area that is available for development affects the efficiency of both alternatives. However, the constraints associated with the buildable area are made more difficult in the Renovation/Addition Alternative.

The two-level, below-grade parking structure required in the Renovation/Addition Alternative is less efficient and generally less accessible to the building occupants than is the single-level structure in the Demolition and Reconstruction Alternative. The site coverage is greater in the Renovation/ Addition Alternative because of the configuration of the existing Laboratory building—a characteristic that also limits opportunities in the Renovation/Addition Alternative for the development of usable outdoor areas.

The Demolition and Reconstruction Alternative avoids a number of programming and design inefficiencies inherent in the reuse options for the original Laboratory building. The floor areas in the Demolition and Reconstruction Alternative are essentially equal, which allows for a more appropriate assignment of the primary office areas. The configuration of the floors in the existing building limit programming flexibility and makes it difficult to satisfy the organizational requirements of the assigned activities and work groups.

B. STRUCTURAL DESIGN ISSUES

The structural system for the Demolition and Reconstruction Alternative provides for an efficient layout of the structural members. This layout provides for the proper fit of all programmed spaces, required floor-to-floor heights, and mechanical and electrical needs. Such a layout is not as feasible with the Renovation/Addition Alternative, since the structural portions of the existing building already are in place. All other systems and spaces must be able to fit within the existing constraints, which are already tight.

The transition between the existing and the new requires a seismic separation to allow the two structures (new and existing) to perform independently from one another, in order to avoid excessive buildup of stress concentration at the incompatible transition between the old and the new. This stress concentration is due to the differences in construction systems, heights, and shape irregularities. The Uniform Building Code (*UBC*) refers to these irregularities as A-Stiffness Irregularity, B-Weight (mass) Irregularity, C-Vertical Geometric Irregularity, D-In-Plane Discontinuity in Vertical Lateral Force-Resisting Element, E-Torsional Irregularity, F-Reentrant Corners, and G-Diaphragm Discontinuity. Thus, the interconnection of the two systems can only promote additional stress concentrations at the transition areas and must be avoided by providing a seismic joint.

However, the portion of the new structure built over and within the existing structure must be attached to the existing structural elements. Additional lateral load-carrying system (i.e., shear walls) must be provided to account for the additional lateral loads from the additional mass of the demolition and reconstruction.

C. CIVIL DESIGN ISSUES

Both alternatives use nearly identical site and utility design criteria. Site features relative to site improvements, roadways, and sidewalks are similar; available parking also is similar. Stormwater will be collected and passed to the stormwater system in similar ways for each alternative.

The water systems use similar connections for both alternatives. The building pipelines will be extended to the Honolulu City System for Domestic and Fire Protection Service. A secondary hydrant is placed near the service entrance. This hydrant connects to the University of Hawaii water system on East-West Road.

The sanitary sewer system will be less than 3 m [10 ft.] deep. It will connect to the City system. The Renovation/Addition Alternative will use a sump pump to remove lower-floor effluent. This pumped system will accommodate shallow utility trenches.

Site disturbance will be confined to the building footprints, parking lots, and roadways. Site excavations differ greatly between the two alternatives, and the Renovation/Addition Alternative will require deep excavation into hard rock using extensive technical blasting. The Demolition and Reconstruction Alternative will require less blasting and hard-rock excavation.

D. MECHANICAL AND ELECTRICAL DESIGN ISSUES

In comparison with the Demolition and Reconstruction Alternative, there are apparent complications with mechanical and electrical design in the Renovation/Addition Alternative.

Envelope insulation and vapor barrier are more difficult to achieve in the Renovation/Addition Alternative (versus the Demolition and Reconstruction Alternative). Also, the location of main mechanical and electrical equipment may require significant architectural and structural changes to the existing building. These changes may be necessary for access to new equipment, for maintenance access, and to carry the equipment weights.

The existing building structure includes significant beams. These may require drilling for access to pipes, ductwork, and conduits. Under the Renovation/Addition Alternative, it may also be necessary to lower ceilings so that pipes, ductwork, and conduits may pass below the beams.

If existing slabs are used, it will be necessary to cut holes in them to create service risers.

Because renovated and new building sections may have different floor levels, there may be complications in getting mechanical and electrical services through the transition areas between the sections.

APPENDIXES

A. COST ESTIMATE—RENOVATION/ADDITION ALTERNATIVE

B. COST ESTIMATE—DEMOLITION AND RECONSTRUCTION ALTERNATIVE

COST ESTIMATES FOLLOW THIS DIVIDER IN PRINTED REPORT

APPENDIX A.

COST ESTIMATE—RENOVATION/ADDITION ALTERNATIVE

APPENDIX B.

COST ESTIMATE—DEMOLITION AND RECONSTRUCTION ALTERNATIVE